

**REMARKS**

In the Office Action, claims 1, 7, 9, 13 and 18-21 were rejected. Claims 2-6, 8, 10-12 and 14-17 are objected to, and claims 22-25 were allowed. By the present response claims 1, 9, 13 and 18 are amended. Reconsideration and allowance of all pending claims are requested. Upon entry of the amendments, claims 1-25 will remain pending in the application.

**Objections to drawings**

Corrected drawings in compliance with 37 CFR 1.121 (d) are attached. As required, Figures 1 and 2 have been designated by a legend stating "Prior Art" and the sheet labeled as "Replacement Sheet".

**Rejections Under 35 U.S.C. §103**

The Examiner rejected claims 1, 7, 9, 13, 18-21 under 35 U.S.C. §103(a) as being unpatentable over Savord et al. (U.S. Patent No. 6,540,682), alone or further in view of Smith et al. (U.S. Patent No. 5,744,898), alone or further in view of Leavitt et al. (U.S. Patent No. 6,540,632) or Miller et al. (U.S. Patent No. 5,740,806). Applicants respectfully traverse these rejections.

The Examiner stated that Savord teaches an integrated circuit 10 in association with an ultrasonic imaging array of individual transducer elements 20, where the integrated circuit 10 comprises a high voltage pulser 14, 24; a receive section amplifier 18; and a transmit receive switch 16 operative during the control of operational phasing, where the receive amplifier is protected in a first transmit state of the switch and unprotected during a second receive phase of the switch. The Examiner recognized, however, that Savord does not teach a switch designated *per se* as "low voltage" for element 16.

Applicants respectfully submit that the independent claims have been amended to more distinctly point out the claimed subject matter. Support for the amendments is available at least in the specification, on page 9 lines 3 to 14. The amended claims recite, in generally similar language, “*a high-voltage transmit/receive switch*” and “*said low-voltage transmit/receive switch being electrically coupled between said high-voltage pulser and said amplifier*”. Applicants urge that inclusion of these phrases makes it clear that the integrated circuit of the present invention has **both** a high-voltage transmit/receive switch and a low-voltage transmit/receive switch, and that both the switches are electrically connected to each other.

Applicants have closely considered the passages referred to by the Examiner and indeed, the Savord patent as a whole. The cited passages from Savord, and the entire reference, do not support the Examiner’s position, however.

As indicated by the Examiner, col. 9, lines 30-35 of Savord recites:

With reference again to FIG. 1A, an example of the optional transmit-receive switch 16 of the unique transducer circuitry 10, according to one embodiment of the invention is illustrated in FIG. 5. In FIG. 5, the transmit-receive switch 16 includes a high voltage FET 124, similar to those ...

Examiner stated that: “Savord would include at least some low voltage control of this switch since power consumption is an IC constraint, and therefore the switch would be low voltage in terms of control under this argument.” Office Action, page 3.

Applicants respectfully submit that Savord fails to teach or even suggest an integrated circuit having **both** a high-voltage transmit/receive switch and a low-voltage transmit/receive switch. As described in col. 6, lines 15 to 30, Savord teaches transducer circuitry 10 including at least one of a *low-voltage transmit circuit* 12 and a *low-voltage receive circuit* 18. Both the low-voltage transmit circuit 12 and the low-voltage receive

circuit 18 are connected between a supply voltage VL and ground. The low voltage receive circuit 18 processes signals, input via line 19, that represent ultrasound energy received by transducer element 20, and outputs the processed signals, to other circuitry or to the electronics unit of the ultrasound imaging system, via line 29. Further, as described in col. 6, lines 33 to 36, the transducer circuitry 10 includes a high-voltage circuit 14, connected between a high supply voltage VH and ground. As discussed in col. 3, lines 26-35, Savord is directed to integrated circuitry including both high and low-voltage components monolithically formed on a single substrate. However, The low-voltage components are intended to receive signals back from a probe (e.g., apparently similar to the claimed amplifier). By, their nature, and more importantly, due to the fact that they *are not coupled between the pulser (high-voltage circuit 14) and an amplifier*, any low-voltage components of Savord can not possibly function as does the claimed circuitry.

By way of illustration of the claimed technique, as described in the discussion of Fig. 3 of the present invention, on page 9, lines 3-14 of the application, the high-voltage switch M<sub>3</sub>/M<sub>4</sub> is connected to the amplifier via the low-voltage switch M<sub>5</sub>/M<sub>6</sub>. The low-voltage switch M<sub>5</sub>/M<sub>6</sub> essentially functions as a protective device by controlling the voltage flow through the amplifier 16.

Applicants respectfully argue that the transmit/receive switch 16 of Savord can, at best, be considered analogous to the high-voltage switch M<sub>3</sub>/M<sub>4</sub> of the present invention; and the low voltage receive circuit 18 can be considered analogous to the amplifier 16 of the present invention, insomuch as circuit 18 functions as an output for processed signals as described above. No circuit corresponding to the claimed low-voltage transmit/receive switch is disclosed by Savord.

Accordingly, Savord does not teach or suggest the use of low-voltage transmit/receive switch to control voltage flow through an amplifier. Savord cannot, therefore render claim 1, and claims depending therefrom unpatentable.

Claims 9, 13 and 18, and their respective dependent claims are believed patentable for at least the same reasons.

### **Secondary References**

Applicants respectfully submit that the secondary references are all directed to rendering the *complete circuit as a low-voltage circuit*. Because Savord does not teach the use of a low-voltage transmit/receive switch, and the secondary references are directed to an overall low-voltage circuit, it would not have been obvious to combine the teachings of Savord and any or all of the secondary references. That is, there is no corresponding low-voltage transmit/receive circuit (or second transmit/receive circuit at all) in Savord to replace with a low-voltage circuit of the secondary references. Conversely, the secondary references teach an opposite approach in which *no* high voltage circuit is used at all.

In view of the foregoing remarks, Applicants respectfully request withdrawal of the claim rejections under 35 U.S.C. § 103(a).

### **Objected Claims**

Claims 2-6, 8, 10-12, 14-17 were objected to as being dependent upon a rejected base claim. Applicants believe that the currently amended independent claims 1, 9, 13 and 18 are allowable. Claims 2-6, 8, 10-12, 14-17, depending from claims 1, 9 and 13, are allowable at least by virtue of such dependency. Their reconsideration and allowance are requested.

**Conclusion**

In view of the remarks and amendments set forth above, Applicants respectfully request allowance of the pending claims. If the Examiner believes that a telephonic interview will help speed this application toward issuance, the Examiner is invited to contact the undersigned at the telephone number listed below.

Respectfully submitted,

Date: 7/24/2007

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